

## **DETAILED ACTION**

### ***Response***

1. This Office Action is in response to the arguments filed March 14, 2008. Claims 1-6 are pending and are rejected finally for the reasons given below.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand et al. (US 6,218,035) in view of Morishima et al. (US 2003/0129467).

Fuglevand et al. teach a proton exchange membrane fuel cell power system. Each fuel cell of the system comprises a pair of current collectors, an anode and a cathode, and a polymer membrane between the electrodes (abstract).

Fuglevand et al. teach that the membrane is a cross-linked polymeric chain containing sulfonic acid groups, and many of the examples disclosed include a methacrylate (column 18 lines 22-29). The methacrylate is considered to be the compound having proton conductivity, since, according to the instant specification, a compound having proton conductivity may be a polymethacrylic acid ([0042]). The instant specification also discloses that a compound having both proton conductivity and

activity to an active energy ray may be used, and examples of such a compound include ones having a sulfonic group ([0048]-[0049]).

Fuglevand et al. teach that the proton conducting electrolyte membrane is sandwiched between catalytic electrodes (column 4 lines 12-24). The electrodes preferable contain a platinum catalyst (column 10 lines 8-10).

As for claim 2, a support matrix, or reinforcement member, is taught by Fuglevand et al. (column 19 lines 39-40). Grafted polyethylene is provided as an example of the reinforcement member (column 19 lines 59-61). The instant specification discloses ethylene as a suitable material for the reinforcement layer ([0063]).

The method limitations and infiltrating limitations will now be addressed.

Fuglevand et al. teach that a mixture containing the membrane material (containing methacrylate) is applied to the support matrix, or reinforcement member. Then, the membrane is polymerized by UV light, an active energy ray (column 19 lines 59-61).

Fuglevand et al. fail to teach that the membrane is coated onto the electrolyte before the membrane is polymerized.

Morishima et al. teach a membrane electrode assembly for fuel cells (abstract). Morishima et al. teach that the membrane electrode assembly may be made by various different methods known in the art, including a method by which the electrolyte solution,

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as in the substance used for the polymer electrolyte membrane, is coated onto the catalyst layer ([0049]).

One of ordinary skill in the art, knowing that this method may be used to form a membrane electrode assembly, might choose to use this method to form the assembly of Fuglevand et al., since such a method would make manufacturing easier because the membrane would be formed integrally to the catalyst layer, which would also provide a more reliable bond.

As for the “infiltrating” limitations of claims 1, 3 and 6, since the membrane of Fuglevand et al. in view of Morishima et al. is made by the same method, and using the same materials, as disclosed in the instant specification and claims, the resulting product would have the same properties, specifically, the property of the membrane infiltrating the electrode catalyst layer.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the method of Morishima et al. to form the membrane electrode assembly of Fuglevand et al., since such a method would make manufacturing easier because the membrane would be formed integrally to the catalyst layer, which would also provide a more reliable bond.

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4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand et al. in view of Morishima et al. as applied to claim 3, and in further view of Akita et al. (US 6,523,699).

The teachings of Fuglevand et al. and Morishima et al. as discussed above are incorporated herein.

Fuglevand et al. in view of Morishima et al. teach a platinum catalyst on the electrodes of the membrane electrode assembly, but fail to teach the thickness of the catalyst layer.

Akita et al. teach a fuel cell having excellent catalytic activity (abstract).

Akita et al. further teach that the platinum catalyst should be 50-250  $\mu\text{m}$  thick. According to Akita et al., for catalyst thicknesses less than 50  $\mu\text{m}$ , there could be an insufficient amount of catalyst, and for thicknesses greater than 250  $\mu\text{m}$ , the possibility of the catalyst surface becoming unstable arises (column 8 lines 31-44).

As for the limitation concerning the depth of infiltration into the electrode catalyst layer, the infiltration would necessarily be equal to or less than the thickness of the electrode catalyst layer, since it would be impossible for the membrane to infiltrate the electrode catalyst layer further than the thickness of the layer. Additionally, since the MEA of Fuglevand et al. in view of Morishima et al. is made by the same method of the instant invention, the infiltration depth would inherently meet this limitation.

It would be desirable to make the platinum catalyst of Fuglevand et al. in view of Morishima et al. 50-250  $\mu\text{m}$  thick, encompassing most of the claimed range, since at

smaller thicknesses, there could be an insufficient amount of catalyst, while at larger thicknesses, the catalyst surface could become unstable.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the platinum catalyst of Fuglevand et al. in view of Morishima et al. 50-250  $\mu\text{m}$  thick, since at smaller thicknesses, there could be an insufficient amount of catalyst, while at larger thicknesses, the catalyst surface could become unstable.

### ***Response to Arguments***

5. Applicant's arguments filed March 14, 2008 have been fully considered but they are not persuasive.

After a brief description of the instant invention on page 2 of the remarks, Applicant states, at the top of page 3, that Fuglevand et al. teach polymerizing the electrolyte membrane material by itself. In fact, Fuglevand et al. teach coating a substrate with the membrane material and then polymerizing it. See Examples 1 and 3 in columns 19-20.

When the catalyst material is used as the substrate, as taught in Morishima et al., the membrane and method of the instant claims is obvious because the solution of polymer membrane electrolyte is coated on the catalyst layer. Since it is a solution, it would inherently permeate the electrode catalyst layer at least to some extent.

6. At the bottom of page 3, Applicant states that Morishima et al. do not teach polymerizing the electrolyte solution after it is coated, while Fuglevand does not teach

polymerization but not pressing. If one of the references taught all of the limitations of the claims, then it would be an anticipatory rejection; however, since the claims are obvious over Morishima et al. in view of Fuglevand as discussed above, then the obviousness rejection is made. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

### ***Conclusion***

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alix Elizabeth Echelmeyer whose telephone number is (571)272-1101. The examiner can normally be reached on Mon-Fri 8-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy N. Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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